

11/15/16 "Motivation gets you started, habit keeps you going."-Jim Rohn

HW: "Solving Rational Equations" #5-23 odd

AIM: How do we solve Rational Equations?

Warm Up:

1) Simplify:  $\frac{4}{x-2} + \frac{x}{x+2}$

LCD  
 $(x-2)(x+2)$   
 $x \neq 2, -2$

$$\frac{(x+2)}{(x+2)} \frac{4}{x-2} + \frac{x}{x+2} \frac{(x-2)}{(x-2)}$$

$$\frac{4(x+2) + x(x-2)}{(x+2)(x-2)} = \frac{4x+8+x^2-2x}{(x+2)(x-2)}$$

$$= \boxed{\frac{x^2 + 2x + 8}{(x+2)(x-2)}}$$

Examples: Solve for the variable

$\frac{6}{6x^2} + \frac{3x^2}{6x^2} = \frac{11x}{6x^2}$

$\frac{6+3x^2}{6x^2} = \frac{11x}{6x^2}$

$6+3x^2 = 11x$

$-11x \quad -11x$

$3x^2 - 11x + 6 = 0$

$3x^2 - 9x - 2x + 6 = 0$

$3x(x-3) - 2(x-3) = 0$

$(3x-2)(x-3) = 0$

$x = \frac{2}{3} \quad x = 3$

$$2. \frac{y+9}{2y} - \frac{15}{y}$$

$$\text{LCD: } 2y$$

$$\frac{y+9}{2y} + \frac{3(-)}{1} = \frac{15(-)}{y}$$

$$y+9+6y=30$$

$$7y+9=30$$

$$\frac{7y+9-9}{7} = \frac{30-9}{7}$$

$$\frac{7y}{7} = \frac{21}{7}$$

$$y=3$$

3.  $\frac{b}{b+4} - \frac{1}{b} = \frac{2}{b+4}$

LCD:  $b(b+4)$

$b \neq -4, 0$

$$\frac{\cancel{b}}{\cancel{b}+4} - \frac{1 \cdot \cancel{b}}{\cancel{b}} = \frac{2}{\cancel{b}+4}$$
$$\frac{b^2 - (b+4)}{b^2 - b} = \frac{2b}{b^2 - b}$$
$$\frac{b^2 - b - 4}{b^2 - b} = \frac{2b}{b^2 - b}$$
$$\frac{b^2 - 3b - 4}{(b-4)(b+1)} = \frac{2}{b+1}$$

LCD:  $(b-1)(b+1)$

$b \neq 1, -1$

4.  $\frac{1}{(h-1)(h+1)} = \frac{A}{h-1} + \frac{B}{h+1}$

$\frac{1}{(h-1)(h+1)} = \frac{1}{h^2-1}$

$\frac{1}{h^2-1} = \frac{1}{h-1} - \frac{1}{h+1}$

$\frac{1}{h^2-1} = \frac{h+1}{(h-1)(h+1)} - \frac{h-1}{(h-1)(h+1)}$

$\frac{1}{h^2-1} = \frac{h+1-h+1}{(h-1)(h+1)}$

$\frac{1}{h^2-1} = \frac{2}{(h-1)(h+1)}$

$\frac{1}{h^2-1} = \frac{2}{h^2-1}$

$1 = 2$

$h-1+h+1 = 6$

$2h = 6$

$h = 3$

LCM =  $(y-3)(y+3)$

$y \neq 3, -3$

5.  $\frac{(y-3)(y+3)}{y+3} = \frac{y(y-3)}{y-3} = \frac{18}{(y+3)(y-3)}$

$y(y-3) + y(y+3) = 18$

$y^2 - 3y + y^2 + 3y = 18$

$\frac{2y^2}{2} = \frac{18}{2}$

$\pm \sqrt{y^2 = 9}$

$y = \pm 3$  (extraneous)

reject  $y = 3$

$y = \emptyset$

No Solution

Alt:  
 $\frac{2y^2}{2} = \frac{18}{2}$   
 $2y^2 - 18 = 0$   
 $2(y^2 - 9) = 0$   
 $2(y-3)(y+3) = 0$   
 $y = 3 \mid y = -3$   
reject

Proportion so cross multiply

restrictions:  
 $x \neq 0$

$$6 = x(x+5)$$
$$6 = x^2 + 5x$$
$$\underline{-6 \qquad -6}$$
$$0 = x^2 + 5x - 6$$
$$(x+6)(x-1)$$
$$(x+6)(x-1)$$

6.  $x+5 = \frac{6}{x}$

6.  $x+5=\frac{6}{x}$

HW: Exercises  
# 10, 24, 27, 31

⊛ If you have a  
proportion (1 fraction equal to  
1 fraction)  
we can cross multiply.

LCD:  
 $6x^2$

$$\frac{1}{x^2} + \frac{1}{2} = \frac{11}{6x}$$

$6 + 3x^2 = 11x$

**Steps for solving rational equations:**

1. Identify the LCD  
(Factor if necessary)
2. Multiply every term of the equation by the LCD. (This will eliminate the denominators)
3. Solve the resulting equation  
(Reject any answer that is a restriction)

**Exercises**

In 1-4, match the equation with the corresponding transformed equation, and state any necessary restrictions on the variable.

1.  $\frac{1}{z^2} - \frac{1}{3z} = \frac{1}{6}$

3.  $\frac{1}{z-2} + \frac{1}{z+3} = \frac{1}{z^2+z-6}$

2.  $\frac{4}{z-1} + \frac{4}{z} = \frac{3}{z-1}$

4.  $\frac{8}{z^2-4} + \frac{1}{z-2} = \frac{1}{z+2}$

a.  $2z+1=1$    b.  $6-2z=z^2$    c.  $8z-4=3z$    d.  $z+10=z-2$

